

Acme Aircraft Company
33" V35 Bonanza



Photo: Ian Anderson

Scale Electric Parkflyer



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Kit Contents

- 8 sheets laser cut wood
- 1 plan sheet
- Vacuum formed windshield/cabin and spinner
- 1/8" dowel - 1"
- 4-40 blind nut and plastic screw
- CA hinge material
- Small washer for right thrust
- 4X 2Mx4mm socket head screws for motor mounting
- 4X 1/8"X1/16" rare earth magnets for securing windshield/cabin
- 3X #0x1/4" pan head Phillips sheet metal screws for securing spinner
- 2X Laser cut sandpaper discs for spinner

Items Needed to Finish

Balsa:

- 1/8" sq. X 36" – approx. 4 pieces
- 1/8"X1"X24" balsa sheet
- 1/8" X 1/16" X 24" balsa – approx 8 pieces
- 3/32" sq. X24" balsa - 4 pieces
- 1/16" sq. X 24" balsa - approx 12 pieces
- 1/16" balsa sheet roughly 4"X3" - optional cabin "floor"

Hardware:

- 1X Dubro 20" Micro Pushrod System
- 1X Dubro Micro Aileron System
- 3X Hitec HS-55 Servos or similar
- 1X Castle Creations Phoenix-10 ESC or similar
- 1X 4 channel micro rx - Berg 4 or similar
- 1X Himax HC2212-1180 Brushless Outrunner
- 1X Himax 2mm Collet style prop adapter - Req. if using supplied spinner setup
- 1X Master Airscrew 6X4X3 Propeller
- 3/32" OD aluminum tubing - 17" total
- .045" music wire
- 3S Lipo battery – 730-910 mah
- Light weight covering material – Solarfilm used in prototype.
- Frisket film and masking tape
- Paint for finishing windshield/cabin and spinner



General Information:

Thank you for purchasing the Acme Aircraft 33" V35 Bonanza. I hope you enjoy building and flying it as much as I did. This is a fun and relatively quick build for a truss fuselage plane. The purpose of this document is not to provide a step by step guide, but to point out any areas in which the methods used may be different from the norm. I suggest a quick read of the document in order to avoid any confusion during the build. The method used for the wing is a little unorthodox, so I have gone into more detail in this section. However, I think you'll find this approach quickly produces a light, strong and true wing.

My goal for the prototype was to create a plane that had a slightly higher wing loading than my "floater" planes, so that I could have something to fly in somewhat breezier conditions. However, this plane could be just as easily built to a lighter weight by substituting Solite for Solarfilm and scaling back on the amount of trim and detail used. If you want to build a lighter version you may also want to consider using a less powerful motor. The Himax HC2208-1260 will fit the exact same bolt pattern as the HC2212-1180 and puts out about 30 watts instead of the 50 produced by the HC2212-1180. The 2208 motor also enjoys a slight weight reduction over the 2212. In addition to the Himax options, a "blank" 1/32" ply firewall former has been included so that you may select another motor of your choosing. The center hole position has been marked with an X, but no other holes have been cut. Any 30-50 watt motor should work depending on the final AUW of your plane. The only restriction is that the case diameter should be 1" or less at the firewall, or it may not fit.

Care has been taken to keep associated parts together on the same sheet and to label parts where necessary. Each sheet has a small number in the lower left corner - when necessary these will be referenced. Leave all parts in the sheets until they are needed. On to the build!

Tailfeathers:

You will notice that there is a 1/32" ply dihedral brace in the stabilizer section of the tailfeathers between the center laser cut pieces and the rear spar. Place a piece of scrap 1/32" ply in this region when framing up to keep the alignment true. Do not glue the center pieces together or the rear spar at this time. Once framed up, prop up each side 3" where marked and bevel sand the junction. Test fit the dihedral brace and then glue together when satisfied with the fit.

Wing:

Start the wing by laminating the Main Wing Spar, W1 and R1/R2B/Ply Bearing - make sure to create a left and right side. Lay the Main Wing Spar on your work table, and glue 3/32" sq. balsa spars to the top and bottom of each side. You can cut the spars roughly to length at this point - about 16 inches. With the spar still on the table, you can assemble the center section of the wing. The Servo Rails are on sheet 6 and are labeled SR. Pay attention that the ply side of W1 faces down.



Wing Continued:

Since there will be a 1/32" sheet d-tube when the wing is finished, during frame up the bottom spar must be elevated by 1/32." 1/32" shims have been provided on sheet 5 for this purpose. Align the main spar with one side of the wing and make sure it is perfectly vertical and shimmed near each rib position. Since the sheer webs have been laser cut, I suggest you lay both the ribs and sheer webs into the main spar before gluing any of it. Also be sure the 1/32" ply reinforcements have been added to R5 and R6. It is important that R2A be exactly perpendicular to the main spar or else you may have trouble fitting the wing to the fuselage, so an angle former (W2) has been included. When you are satisfied with the fit and alignment of all the ribs glue them in place. Add the 1/16" sq. rear spars and the 1/32" trailing edge pieces. There is a 1/32" balsa cap that goes on the 1/16" sq. rear spars at the interface between the wing and aileron - it is labeled AI (sheet 4). Add the 1/16" False Leading Edges - labeled FLE1&FLE2 on sheet 3. Remove the wing from the board and gently sand the top and bottom of FLE1&FLE2 so that they match the curve of each rib. Return the wing to the board to attach the top wing skin - you should still have the shims in place to keep everything square. I like to use wood glue as a personal preference, but for attaching the wing skins it's a necessity, with two exceptions. Use wood glue for the main spar and all the ribs except R3A. On R3A and the False Leading Edges, I suggest you use thick CA. Lay the top sheeting on the main spar and then slowly wrap the skin towards the leading edge. Hold the leading edge and the area around F3A until the CA has set. Make sure the wing does not lift off of the board during this procedure as this will lock in a twist in the wing. Once the top sheeting has set, do the same with the bottom sheeting. Make sure to check that you have not pulled the wing out alignment by periodically placing the wing on your table - all the build tabs on the ribs should rest on the surface of the table.

Now repeat the above procedure with the second wing half. Once finished, sand the wing sheeting flush with the false leading edges and then glue some 1/8" sheeting to them. Sand the leading edges of the wing to match the profile shown on the plan. Now add the 1/8" balsa wing tips, 2 per side, and sand to shape.

The ailerons are a simple combination of 1/16" ribs and 1/32" laser cut pieces. A1A/B/C is a 3 piece sandwich designed to retain the end of the torque tube. A1A always faces towards the center of the wing. Lay the trailing edge piece (ATE) over the plan and then glue the ribs in place. Glue the top ATE in place. Two pieces of 1/32" balsa form the beveled edge of the ailerons. They are labeled AB. Glue them in place so they overlap at the center line as shown on the plans. Sand the top and bottom flush with the top and bottom of the ailerons.

Follow the torque tube instructions included on the plans. It is important that you NOT use 1/16" music wire for the ends of the torque tubes. The problem is that they fit so well inside the 3/32" OD aluminum tubing that they push all epoxy out of the joint, causing the joint to fail even under light loads.



Fuselage:

The fuselage is standard truss style construction. The bottom front 1/8" sq. piece can either be made from flexible balsa that has been soaked in hot water/ammonia, or it can be made from two laminations of 1/16"X1/8" balsa. Either way will work fine, it just depends on how flexible the balsa you have on hand is. Build both fuselage halves and then join the two sides upside down on your board. When joining the fuselage halves, pay attention to the orientation of F5 and F6 - make sure the ply sides are facing the correct direction. Note that there are no cross pieces at the very front of the fuselage. Since it is not possible to add F1A/B while the fuselage is being joined on the board, I suggest you place a temporary cross piece glued to the 1/8" laser cut pieces. Once the rest of the fuselage has been joined, remove from the board, add F1A/B and then remove the temporary cross piece. You should bevel sand the front of the fuselage to mate with F1A/B. Also note the washer that should be glued to the right-inside motor mount hole to provide right thrust. This is included in the hardware bag.

Add the formers to the top and bottom. If you will be using covering that has either very gentle or small shrinkage you can omit F8 and F10 along with their respective cross pieces. On the prototype, Solarfilm was used for covering, and the stringers pulled in somewhat in these sections. These formers were added in response to that. However, if you are using Solite and have a light touch with the heat gun, it is possible these could be omitted. Test fit the tail feathers in their saddle and sand the leading edge of the center section if need be. Once the stab fits well between the formers, add all the stringers in the tail section. Laminate the 5 pieces of 1/8" balsa that form the tail block (TB), glue in place and sand to shape. Glue the 3 pieces that form the cowl faces onto F1A and then sand to shape. Just barely round the top edge as shown on the plans, or else the back of the spinner will be visible.

Spinner:

The spinner provided is a little tricky but will give you a very scale and light spinner if done correctly. Start by gluing the three 1/8" balsa spinner mounting pieces onto the 1/32" ply back plate as shown on the plans. Since these occasionally break, three extra pieces have been included in the kit. To keep the plate from shifting, you may want to glue the plate to your wax paper with a drop of thick CA. Trim the extra material from the base of the vac formed plastic. Take a piece of scrap 3/32" balsa sheet and glue a t-pin to it with some of the tip hanging off the side. Slide the spinner down over the assembly and make three holes in the plastic and balsa using the t-pin at the locations marked for the screw attach holes. It's important to get them spaced exactly as shown on the plan or you may end up with an unbalanced spinner. Using a pencil mark the locations of the prop cut-out centerline on the spinner. Now remove the plastic, and carefully drill out the holes in the balsa with a 1/16" drill bit by hand. Enlarge the holes in the spinner with a blade. Put some thin CA in the holes and then gently thread the #0X1/8" screws in the holes. Trace the prop cutouts on the plastic spinner and carefully cut these sections out. Now, using thick CA, glue the two sandpaper discs to the front and back of the spinner. The spinner plate is then sandwiched between the back portion of the collet adapter and the prop.



Windshield/Cabin

The canopy is very much like an RC car body, so if you've ever done one of those, you should find it pretty straight forward. You will be masking and painting the inside surface. Start by cleaning the canopy with soap and warm water. You should wear gloves whenever handling the unpainted canopy to avoid getting the oils from your fingers on the surface, which could affect the paint. Roughly trim the canopy just so that it will sit over the fuselage. Place it on the fuse so that the line of the windshield connects with the fuse about halfway between F3 and F4. Tape it in place and then trace around the canopy with a marker. Leave about 1/8"-3/16" extra around all sides. You can use an ultra fine point Sharpie and simply clean it off later with Windex. Now trace the outline of the windshield on the outside, and also the line that runs along the bottom of the side windows. Remove the canopy from the fuselage, and then trim it around the edges to size. You may want to sand the edges a little get knock any sharp edges off. Lay some frisket film on the inside of the canopy in the windshield area. You may have to use more than one piece due to the compound curves. With a very sharp blade, trim the frisket film around the windshield lines. Now create the frisket pieces for the windows using the templates supplied in the PDF template file. Be sure to make them for both the left and right side. Attach them to the inside and then scuff up the exposed areas with 400 grit sandpaper. Completely mask the outside surface. Now paint the inside using a paint specifically formulated for plastic, like Pactra Racing Finish. Once dry, carefully remove the frisket film.

To attach the canopy, you will first have to have the fuselage covered. The canopy attaches to the fuselage using two formers and rare earth magnets. Glue a magnet into F4 and F7, and then glue into C1 and C3. Check the magnet polarity before you glue it into C1, you don't want the magnets to repel each other. While the 1/16" balsa floor and instrument panel (C2) are optional, I highly suggest putting them in. They greatly increase the area that is attached to C1, which will reduce the stress on the paint. Lay some plastic wrap down on the fuselage between the fuselage and canopy formers. Trim the plastic wrap so there is about an inch extra all around. Now remove them and run a bead of canopy glue around the sides of C1 and the edges of C3 and the floor. Place them on the fuselage, making sure the plastic wrap does not cover the edges of the formers. Place the canopy over the fuselage, making sure to put it in the correct fore/aft position. Also make sure the canopy sits flush against the fuselage at the front, or else it may want to separate during flight. Tape the canopy to the fuselage and let the glue dry. When cured, remove the canopy, making sure to pull it gently straight up and then remove any plastic wrap that may have become glued to the canopy.

Balance & Control Throws:

Balance 1/4" in front of the main spar. For control throws, the following were used on the prototype:

Ailerons: 3/8" for high rates, 65% of that for low rates

Ruddervators - Elevator: 1/4"-3/8" for high rates, 70% of that for low

Ruddervators - Rudders: 5/8" for high rates, 65% of that for low rates



Flying:

To launch, give a nice straight and slightly upwards (5 degrees or so) toss. Use the fuselage gussets behind the wing for your finger grips. You may want to have a friend do the launch on the maiden flight, until you have it completely trimmed out. You'll find that she can do simple aerobatics with ease - loops, rolls and snap rolls all look very nice and clean. She'll turn very well on just aileron and elevator - there's not any need for rudder mixing that I can see. For landing, bring her in over grass and try to simply hold her about 6-8" off of the ground for as long as possible.

I hope you've enjoyed building and flying the V35 Bonanza as much as I have. I think it's a great plane both in terms of looks and performance. Thank you for purchasing an Acme Aircraft kit, I truly appreciate your business and hope you will buy more Acme kits in the future.

Schuyler Greenawalt
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